

ABSTRACT

A simple, relatively inexpensive, yet effective PLD method is provided for forming extremely clean films with reduced particulate densities and size. A PLD system is used for producing the thin films and includes a PLD chamber wherein a laser beam ablates a target material creating an ionized plasma plume of ions and electrons which is diverted and deposited onto a substrate using a confinement magnet and a deflection magnet. Each of the confinement magnet and the deflection magnet generates an axial magnetic field which is generally parallel to the laser beam plume ejection direction. The charged constituents of the plume are influenced by the magnetic fields and are thus deflected to the substrate, while the larger atomic clusters and particulates are advantageously not deflected. An electric field can also be used to aid in the deflection of the charged plume species. The electric field can be separately modulated to control the film deposition onto the substrate. This method favors useful film properties, such as crystallinity and good adhesion, even at room temperature, because it relies upon using high energy ions for the deposition.